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ABSTRACT

To identify specific instructional features prompting meaningful change among teacher candidates, this literature review evaluated studies that examined the influence of teacher education coursework on preservice teachers' conceptions and practices. Literature came from books and from journals published between 1992-96. The review examined whether studies reported a relationship between particular practices and important outcomes for preservice teachers. Of the 43 studies evaluating this relationship, 32 reported meaningful learning in preservice teachers. This article describes instructional features associated with preservice teacher learning as reported in the 32 studies, discussing the review methodology and inclusion criteria guiding the best-evidence synthesis. It gives examples of the 12 instructional features used in studies reporting significant learning and evaluates the quality of supporting evidence. The features include: view modeling; course content used in context; information presented about the content; repeated reflection on/use of a limited number of principles; experienced teacher participation; assigned readings; integrating concepts across courses and/or sequencing courses; discussing, analyzing, or solving problems with peers; trying out/practicing course content; individual assignments; interaction with instructors; and experiencing the principle over an extended period. (Contains 64 references and 2 tables.) (SM)

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What Works in Teacher Education?

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Abstract

Forty-three studies were selected to be part of a best-evidence synthesis that examines the influence of teacher education course work on preservice teachers' conceptions and practices. Taken together, nine of these studies report limited change, 32 report meaningful change, and two studies report mixed results. In conducting a content analysis of the instructional features present within the 32 studies reporting meaningful change, 12 instructional features emerge as important in producing change.

The purpose of this article is to provide teacher educators with a detailed description of these 12 instructional patterns. With knowledge of the instructional features used in studies that suggest meaningful change among candidates, teacher educators can better examine their own pedagogical practices as they seek to increase their students' learning.

What Works in Teacher Education?

Studies of preservice teachers' conceptions of teaching and learning reveal that many of their ideas conflict with parts of the knowledge base in education (e.g., Book, Byers, & Freeman, 1983; Mahlios, Marc & Maxson, 1995; McCall, 1995; Weinstein, 1988, 1989). For example, Ball (1988) found that beginners view teaching as telling and testing, rather than facilitating students' construction of new learning. And unfortunately, the question of how to help teacher candidates develop a detailed and organized conceptual understanding of the knowledge base for teaching is widely debated. This controversy is evident in the enormous array of instructional approaches that researchers advocate within the teacher education literature (e.g., Lundeberg & Fawver, 1994; Metcalf, 1992; Morine-Dershimer, 1989), from autobiography to microteaching. Further, various socialization and life history researchers insist that teacher education is simply not powerful enough to restructure candidates' conceptions (Bullough, 1995; Lortie, 1975; Zeichner & Gore, 1990), while others (e.g., Winitzky & Kauchak, 1997) argue that teacher education does change candidates in significant ways. From the point of view of both camps, there is a need to identify the conditions that prompt meaningful change in candidates' conceptions and practices during their teacher education experience.

To identify specific instructional features (i.e., clusters of related teaching strategies) that prompt meaningful change among candidates, we began by searching the literature for studies that examined the influence of teacher education course work on preservice teachers' conceptions and practices. We conducted a best-evidence synthesis of these studies, and focused on whether they reported a relationship between particular practices and important outcomes for teacher education students. Of the 43 studies that examined this relationship, 32 reported meaningful learning in preservice teachers. For purposes of this review, we used the investigators' judgements about whether meaningful learning had happened or not. Our purpose in this article is to describe the instructional features associated with preservice teacher

learning as reported in these 32 studies. We turn first to a discussion of the review methodology and inclusion criteria which guided our best-evidence synthesis. Next we describe and give examples of the 12 instructional features used in studies reporting significant learning, and evaluate the quality of supporting evidence. Finally, we draw conclusions and make recommendations for future inquiry.

Review Methodology

An examination of the literature concerning the influence of teacher education on candidates' conceptions and practices began by reading seminal chapters within several books. These books included: Handbook of research on teacher education, The teacher educator's handbook, Exploring teachers' thinking, Teachers' professional learning, and Constructivism: Theory, perspectives and practice. At the same time, we scrutinized the bibliographies of several germane studies, such as, Derry (1996), Gelman (1996), Hollingsworth (1989), Holt-Reynolds (1992), Weinstein (1989), and Winitzky and Kauchak (1997) for related studies. The lead author then generated combinations of key words and completed a computer search of ERIC and Education Indexes for the years 1981 through 1996.

Following the database searches, hand searches of five journals for the years 1992 through 1996 were completed. The authors made a judgement concerning the journals that were most relevant and would have the most to say about teacher education. These journals were Teaching and Teacher Education, Journal of Teacher Education, American Educational Research Journal, Review of Educational Research, and Journal of Educational Psychology. A noted teacher education scholar also nominated several studies from other assorted journals.

We limited the articles selected for consideration to those that specifically centered on teacher candidates rather than teachers generally. We included studies that investigated change during student teaching or that extended into candidates' first year of teaching only if they met one criterion. That is, the examination of change had to be intimately connected with formal course work taken before or integrated throughout the experience.

This requirement helped to ensure that the included studies specifically focused on the influence of university course work on preservice teacher learning.

Studies presented at meetings were excluded in favor of published studies because these are generally subjected to more rigorous standards during peer review. Further, we examined all articles holistically and excluded studies of marginal quality. Indicators of methodological quality were appraised, e.g., the sample size, evidence of triangulation, study duration, instrument validity and reliability. It was not possible to set specific parameters for each indicator because study methodologies varied considerably. That is, most studies used mixed designs making categorization based on type of study design impossible. We made a decision concerning the inclusion of each on a study by study basis. Imagine, for example, that a study contained a small sample size and utilized only two methods of data collection. It would have been excluded, but, its prospect of being included increased if it extended over more than one semester or quarter, and utilized an instrument(s) in which validity had been firmly established. Of approximately 68 germane studies, we included 43 studies.

Next we conducted a content analysis of the instructional features present within those included studies that reported preservice teacher learning, following guidelines established by Miles and Huberman (1994). The lead author developed codes for the instructional features inductively. She first noted decision rules and constructed an operational definition and qualifications for each code. Over a number of months, coding of the same descriptions of instruction occurred several times to ensure that intra coder agreement reached 90% or better. Further, pattern codes were developed to further condense the codes and make them more inclusive. A matrix was constructed to display the patterns of instructional features according to their frequency counts. Throughout the content analysis, written memos facilitated the refinement and expansion of codes, as did the authors' joint analysis meetings.

Instructional Features within Studies Reporting Meaningful Learning

In conducting a content analysis of the instructional features present within the 32 studies reporting meaningful change, 12 instructional features emerged (see Table 1). We define each of these 12 features in the sections that follow (see Table 2), and provide examples of how different instructors used them. Our discussion is organized so that those instructional features with the least empirical evidence linking them to preservice teacher learning are discussed first. These include: (a) view modeling, (b) use course content in context, (c) information presented about the content, (d) repeated reflection on/use of a limited number of principles, (e) experienced teacher participation/interaction, (f) assigned readings, and (g) integrate concepts across courses and/or sequence courses. Those five features that have the best evidence are then discussed. They include: (a) discuss, analyze, or solve problems with peers, (b) try out or practice course content, (c) individual assignments, (d) interaction with or coaching from the instructor, and (e) experience the principle over an extended period. Note that researchers' descriptions of the instruction that candidates received most often contained more than one instructional feature. In our discussion of each feature, we have inferred what the underlying assumptions might be. The studies we included did not discuss the underlying assumptions for the various teaching strategies used with candidates.

View Modeling

An assumption underlying this instructional feature is that if candidates see, for example, a teaching method or skill, they will then have a mental representation of such action. Teacher educators also assume that modeling is one of a number of ways to help candidates transform declarative knowledge into procedural knowledge.

Forms of modeling included viewing: (a) video cases as exemplary examples of instructional features, (b) a videotaped demonstration of target behaviors, (c) the instructor modeling a behavior, (d) a classroom teacher

using a method, (e) a peer using a method during peer teaching, and (f) a course being taught in a cooperative learning format. Two examples come from Morine-Dershimer (1993) and Metcalf (1992).

Morine-Dershimer (1992) described the instruction candidates received during a general methods course. She indicated that students planned and taught lessons with three different models, "first in peer teaching settings, and later in their field placement settings" (p. 16).

Also during a methods course, Metcalf (1992) investigated the effects of a guided training experience on candidates' instructional clarity. Candidates received a manual, viewed a videotaped demonstration of target behaviors, and discussed the video with the instructor. Candidates were told to work through the manual and attempt to implement the content in field observations and practice teaching exercises.

Use Course Content in Context

An assumption underlying candidates' use of course content in context is that if they are held accountable for using or practicing course content in a school setting with pupils, they will be better able to make theory-practice connections. Some common forms of using course content in context include: (a) an integration of course work and practice teaching, (b) tutor sessions with children, (c) practice using teaching models in a field placement, (d) teams of candidates teach lessons to pupils, and (e) field observations. Examples in this category come from Rovengo (1992) and Stofflett (1994).

Rovegno's goal was to "describe what and how seven preservice teachers learned during a field-based elementary physical education methods course" (p. 70). During the course, candidates followed "a planning, teaching, reflecting-on-teaching cycle" in practice teaching (p. 71). After planning and presenting these lessons, candidates reflected in a variety of ways, including dialogue journals, conferences with the professor, and class discussions.

Stofflett (1994) described many instructional features used with candidates during a science methods course for elementary education majors.

One of these included using course content, specifically conceptual change pedagogy, in context. Candidates diagnosed children's concepts and developed three lessons in which they shared and discussed their ideas with peers. Each student taught three 45-minute lessons, one each week in a 3-week field placement. Class discussions addressed the difficulties candidates encountered so that they could improve planning their next lesson. Candidates and the instructor challenged ideas that the pedagogy would not work.

Information Presented about the Content

This instructional feature in-and-of itself is teacher-centered. That is, the focus during instruction is on the teacher, and students are not very active. This type of practice is consistent with a transmission model of teaching and learning. When information about the content is presented via instructor, guest speaker, panel, or film, instructors generally also use other instructional features that enable candidates to be more active participants. Additional forms of presenting information about the content included: (a) teaching episodes or vignettes on video, (b) direct instruction, (c) lecture, (d) video cases, and (e) discussions of concepts, principles and issues. Tran, Young and DiLella (1994) described instruction where this feature is prominent.

Tran et al. (1994) indicated that lecture, guest speakers and discussion were the predominant forms of instruction used during an introductory multicultural education course. Assignments included multicultural lesson plans, interaction with individuals from minority groups, a cultural autobiography, panel discussion featuring an ethnic group, and papers on educational strategies.

Repeated Reflection on/Use of a Limited Number of Principles

Instructors used many different forms of this instructional feature. An assumption underlying this set of practices is that numerous, and often varied experiences with a limited number of ideas will aid candidates in developing a deep understanding of those ideas. Use of this feature is in stark contrast to a surface coverage of a wide range of topics. Information processing

theories, with their focus on multiple representation, support the use of this instructional practice.

A few forms of this instructional feature include: (a) the same instructional process is used over a series of courses, (b) candidates read about a limited number of models, use them in peer teaching and later in field placement settings, and write papers to reflect on their use of each model (c) to learn four strategies, an instructor presents information about each one, candidates analyze videos in groups that portray each strategy, and they practice components of each strategy in role-playing activities, (d) candidates construct portfolios across one semester in place of all other assignments, (e) candidates participate in group problem solving throughout a course, and (f) candidates participate in many learning experiences focused on a few central notions. Wilcox, Schram, Lappan, and Lanier (1991) and Langrall, Thornton, Jones and Malone (1996) described examples of candidates' repeated reflection and use of a limited number of principles.

Wilcox et al. (1991) investigated the influence of building a community of learners on "learning mathematics and learning to teach mathematics" (p. 32). The instructional approach used across a sequence of three courses had several common features. The instructor would pose a problem that could not be solved using an algorithm. Students worked in small groups to see and discuss each others' thinking and arrive at a way to analyze and simulate the problem using mathematical theory. As they worked together, the teacher would pose additional questions to each group to extend their thinking. The whole class would then examine the multiple ways of solving the problem. Each group would justify the reasonableness of their process, and the instructor would pose additional questions.

In a similar instance of mathematics teacher education, Langrall et al. (1996) reported that candidates met each week for 2 hours during an elementary mathematics methods course. The instructors modeled an inquiry approach and focused on a limited number of NCTM Standards. Students used principles based on the standards to reflect on instructional decisions throughout the course.

Teacher candidates: (a) collaboratively solved problems, (b) analyzed ways of describing pupil's thinking, (c) examined videotapes of teaching and discussions with children, (d) created worthwhile mathematics tasks, and (e) collaboratively planned lessons for field experiences. In addition, candidates participated in 11 practicum experiences, taught three demonstration lessons, taught at least one of six lessons planned by four to six students and took notes on the others, interviewed individual pupils, and collaboratively reflected about the lessons and interviews.

Experienced Teacher Participation/Interaction

Several lines of inquiry suggest that the interaction of experienced teachers and candidates can be advantageous. Social perspective theorists such as Cole (1991), Lave (1991), Resnick (1991), Rogoff (1991), and Wertsch (1991) maintain "that learning occurs through the mediation of social interaction" (Reynolds, Sinatra & Jetton, 1996, p. 98). Further, Vygotsky (1987) notes the benefits of interacting with more experienced others. Some studies of candidates' beliefs and attitudes also suggest that they place more value on the knowledge of teachers with whom they work than they do on the content of university course work. A careful selection of experienced teachers is, therefore, important.

Experienced teacher participation and/or interaction can take many forms. Forms uncovered in this search were: (a) interaction of experienced teachers with all aspects of a program, (b) field placements with cooperating teachers who have contrasting viewpoints, (c) combining and integrating graduate and undergraduate courses so that candidates each have a mentor, (d) experienced teacher-led discussion and analysis of videotapes followed by component practice of strategies in role-playing activities, and (e) observation of a cooperative learning lesson in an experienced teacher's classroom followed by an examination of the lesson with the help of the teacher. Herrmann and Sarracino (1993) and McDevitt, Heikkinen, Alcorn, Ambrosio, and Gardner (1993) described examples of interaction between experienced teachers and candidates.

Herrmann et al. (1993) described the instruction during a literacy methods course for majors in early childhood or elementary education. They restructured the course to include four major changes. One of them included providing mentors for candidates "by combining and integrating two semester-long graduate and two semester-long undergraduate" courses (p. 96-97).

In contrast, McDevitt et al. (1993) described the instruction elementary education majors received learning to teach mathematics and science. Instructors integrated concepts across their 9-course sequence, and taught the way they wanted students to teach. Attention was given to problem solving, investigative hands-on activities, laboratory work, and cooperative learning. The researchers noted that experienced teachers worked with all aspects of the project.

Assigned Readings

When instructors utilized assigned readings, they were never the sole instructional feature. They were used as a basis for information, decisions, practice, analysis, and reflection. An assumption is that readings are one way to help candidates develop socially common knowledge. Nevertheless, this type of practice is consistent with a transmission model of teaching and learning. Assigned readings can take many forms including: (a) using the NCTM Standards as a text, and focusing candidates' attention on a limited number of them, (b) having candidates read to help them understand the options they have for making changes in their approach to multicultural education, (c) reading cases from a textbook that are then discussed during class, (d) reading and working through a manual to then implement the content in field observations and practice teaching, and (e) reading about a model and using the readings to then use it, analyze its use, write about it, and make decisions with it. Two descriptions come from Lawrence and Bunche (1996) and Lundeberg et al. (1994).

During a course focused on multicultural education, Lawrence et al. (1996) indicated that instructors employed readings in combination with other instructional features. These researchers reported two aspects of the course that were influential in helping students learn certain ideas. One of them

was particular course readings which helped class members to understand the options they had for making changes in their teaching.

Lundeberg et al. (1994) examined the use of cases with secondary education majors enrolled in three sections of a sophomore level educational psychology course. The instruction consisted of case methods used in combination with several other instructional features. The cases came from various sources. One of these sources included 12 cases that emphasized theoretical principles from each chapter in the text.

Integrate Concepts Across Courses and/or Sequence Courses

A number of studies mention sequencing courses so that candidates' knowledge builds over time. Given that many teacher educators view candidates' learning as a developmental process in which their focus gradually changes, attention to this program aspect warrants consideration. Instructors also integrate concepts across courses so that candidates experience, practice, reflect on, analyze, view, use, and are coached by instructors again and again. This feature enables candidates to truly process key concepts. Two of the very best examples, mentioned previously, include McDevitt et al. (1993) and Wilcox et al. (1991).

McDevitt et al. (1993) described the instruction used with elementary education majors for learning to teach mathematics and science. Instructors integrated concepts across their 9-course sequence, and taught the way they wanted students to teach. Attention was given to problem solving, investigative hands-on activities, laboratory work, and cooperative learning.

Similarly, Wilcox et al. (1991) described the instruction used with candidates to build a community of learners on "learning mathematics and learning to teach mathematics" (p. 32). Candidates in elementary education enrolled in a sequence of three nontraditional courses.

The instructional approach used across the courses had several common features. The instructor would pose a problem that could not be solved using an algorithm. Students worked in small groups to see and discuss various members' thinking and arrive at a way to analyze and simulate the problem

using mathematical theory. As they worked together, the teacher would pose additional questions to each group to extend their thinking. The whole class would then examine the multiple ways of solving the problem constructed. Each group would justify the reasonableness of their process, and the instructor would pose additional questions.

Discussion, Analysis or Problem Solving with Peers

This instructional feature is characterized by candidates interacting with their peers to construct knowledge. Two assumptions concerning this feature include: (a) candidates' thinking is reorganized due to examining, using, and building on each others ideas, and (b) thinking about ideas from varying viewpoints with peers enables candidates to learn much more than they could on their own.

The nature of such interaction can take many forms. Forms included discussing or analyzing with peers a lesson, lesson plan, case, video tape, decision outcome, issue, problem, instructional alternatives, classroom activities, or course content. Within some studies, candidates also completed group assignments such as: (a) teaching small groups of children, (b) teaching a lesson to another team which then provides analysis, (c) papers, (d) concept maps, (e) projects, (f) exams and (g) lesson plans. The instructional approaches described by Copeland and Decker (1996), Raymond and Santos (1995) and Winitzky and Arends (1991) provide three very different examples of ways in which candidates interacted with their peers in discussion, analysis or problem solving.

In Copeland et al. (1996), groups of three candidates viewed a video case of a reading lesson that represented several issues concerning teaching and learning. The groups then reviewed segments again after seeing the whole vignette once through. Each group discussed the case from varying viewpoints, noting important implications, and reflected about the case in writing.

Winitzky et al. (1991), in contrast, used a very different approach during a methods course. They explained how they taught four strategies. The first of two sessions on each strategy consisted of the instructor presenting

information about the teaching strategy. Then during the second meeting, candidates in the microteaching condition "prepared a lesson using the strategy, presented the lesson to a small group of peers, and received feedback from them" (p. 62).

Further, Raymond et al. (1995) described several instructional features in a course that focused on "learning mathematical concepts through problem solving in cooperative learning situations" (p. 60). Problem solving activities were developed to challenge candidates' ideas about content. Reflection on "the cognitive and metacognitive aspects of their thinking" was emphasized (p. 61). Candidates were evaluated through a notebook (class activities, homework, reflections), group projects, two midterms and a final exam (the three tests consisted of group problem solving, an individual follow up to the problem, a section completed individually). The teacher facilitated discussion, asked questions, challenged misconceptions, and served as a model. Cooperative learning and problem solving provided candidates with opportunities to explain their understandings to others, learn from others, and see that many ways exist to solve a problem.

Try Out or Practice Course Content

An assumption teacher educators make concerning this practice is that it will enable candidates to transform their declarative knowledge into procedural knowledge. Skill learning theory dictates that practice is required for procedural knowledge growth.

Three forms of trying out or practicing course content were: (a) practice models of teaching with peers during micro teaching or peer teaching experiences, (b) practice strategies in role-playing activities, and (c) construct portfolios. Illustrations of this technique come from Morine-Dershimer (1989) and Pedersen and McCurdy (1992).

Morine-Dershimer (1989) placed candidates enrolled in a generic methods course in undergraduate-graduate pairs matched on several characteristics. Each student participated in four reflective peer teaching sessions. For each model students: (a) read about it, (b) participated as a student in a

demonstration lesson, (c) planned a lesson, (d) taught a lesson, (e) analyzed the lesson in a group, (f) received feedback, and (g) wrote a paper to reflect on their planning and decision making. The student pairs gave each other help by discussing their plans before teaching, taking notes during the lesson, writing down feedback from the group members, and providing feedback.

Pedersen et al. (1992) described candidates' experiences during a science methods course. The course was held for three, 3-hour sessions per week (1-hour lecture, 2-hour laboratory experience). The laboratory experience emphasized peer teaching. Each four-student team taught lessons to another team which provided analysis, evaluation and feedback. During a 3-week practicum, each team taught lessons, with the leadership role rotating among members.

Individual Assignments

An underlying assumption for having candidates complete individual, written assignments is that they learn through using or reflecting on course content. Hollingsworth (1989) notes, for example, that candidates learn concepts that they are held accountable for through assignments. Planning lessons is an assignment that emerged over and over again across studies.

Some other forms of individual assignments include: (a) research assignments in classrooms, (b) formal papers, (c) notetaking, (d) reflection papers, (e) autobiographies, (f) creating learning activities and teaching strategies, (g) written reports for parents of children who received tutoring, (h) dialogue journals, and (i) collecting critical incidents or reflections of course events. A description from Lundeberg et al. (1994), mentioned previously to highlight another feature, and Mokhari, Yellin, Bull, and Montgomery (1996) depict various forms of individual assignments completed by candidates.

In an educational psychology course, Lundeberg et al. (1994) described how the instructor used seven research assignments in combination with other instructional features. The instructor synchronized research assignments to correspond with theories covered during the course. These assignments

required students to interview, observe and study students, teachers and classrooms. Further, the instructor linked five of them with 25 hours of field experience.

In a study conducted by Mokhari et al. (1996), in contrast, researchers explained that an instructor discussed assessment issues with elementary education students, and supplied them with a handout on what course portfolios should include. Each student constructed one in place of other graded assignments and tests.

Interaction with the Instructor

The social interaction that takes place between candidates and an instructor is one means of enabling candidates to construct knowledge. Social constructivism, sociocultural perspectives and situated cognition help to account for candidates' knowledge development during such interaction.

As with the other instructional features, forms of interaction between instructors and candidates varied across courses and programs. Some forms included: (a) direct, on-the-spot coaching as candidates tutor children or consider alternatives and critique decisions during case analysis, (b) questioning candidates to extend their thinking in cooperative learning groups, and as each group justifies/explains their thinking to the whole class, (c) written and verbal feedback on assignments, (d) individual conferences to discuss videotaped lessons and the accompanying analysis within journals, and (e) discussion of experiment results using the Socratic method. Roskos and Walker (1994) and Stroiber (1991) described differing examples of interaction between instructors and candidates.

In describing a course that emphasized reading diagnosis, Roskos et al. (1994) noted several instructional features designed around situated learning. One prominent form of interaction with the instructor occurred as candidates tutored elementary children during 22 sessions at the school. Instructors observed teacher candidates and gave on-the-spot help during the tutor sessions. Further, teacher candidates met together following the tutor sessions to debrief as a group and participate in problem solving activities

in which they had to express and defend their thinking.

In another example, Stroiber (1991) described instruction with elementary education majors as centering on analysis of classroom cases to consider alternatives and critique decisions based on their outcomes. Instructors encouraged candidates to construct mental images of situations, decisions, actions, and outcomes, and had them think aloud when solving problems to monitor their own thinking.

Experience the Principle Over an Extended Period

Lortie (1975) and others maintain that candidates' beliefs about teaching and learning are difficult to restructure due to the "apprenticeship of observation" they have experienced during their own school years. One way to address this problem has been for teacher educators to teach in ways that allow candidates to experience the principles they are expected to learn.

The instruction teacher educators use so that candidates experience a principle over an extended period takes many forms. Some of these included: (a) teaching a course in a cooperative learning format, (b) using an inquiry approach, (c) experiencing principles to learn mathematics or science subject matter, and (d) having candidates experience concepts or principles as students in lessons taught by peers during peer teaching. Lawrence et al. (1996) and Winitzky et al. (1991) portrayed differing forms of this instructional feature.

Lawrence et al. (1996) described several aspects of the instruction that candidates received during a course on multicultural education. In discussing the aspects of the course that were influential in helping students learn certain ideas, they depicted one class session: "Students individually read aloud from index cards . . . one of McIntosh's 25 acknowledged privileges" with the word 'not' placed before the verb when read by students of color (p. 536-537). As a result, the researchers said that students reported recognizing the benefits of being white because "reading the individual statements of white skin privilege in the article brought to consciousness aspects of their whiteness that were otherwise unconscious to them. The class

discussion also forced them to acknowledge the benefits they received from white privilege and to hear how people of color experienced daily life in a white-dominated society" (p. 537).

Winitzky et al. (1991) provided still another form of experiencing principles. During the second in a series of three studies, these researchers taught candidates about cooperative learning "in a cooperative learning format" (p. 58).

Discussion

Our analysis suggests that instructional features commonly used in teacher education may significantly influence preservice teacher learning. Several of the 32 studies included in the analysis provide evidence for some instructional features they report using, but not others. Those studies that provide evidence support the use of five features. These are: (a) discuss, analyze, or solve problems with peers, (b) try out or practice course content, (c) individual assignments, (d) interaction with or coaching from the instructor, and (e) experience the principle over an extended period.

Six studies (Copeland et al., 1996; Langrall et al., 1996; Morine-Dershimer, 1989; Raymond et al., 1995; Roskos et al., 1994; Stoiber, 1991) provide evidence that change was prompted by analysis or reflection with others, peers particularly. Four studies (Hollingsworth, 1989; Langrall et al., 1996; Morine-Dershimer, 1989; Roskos et al., 1994) provide evidence that practice or use of course content aided candidates' learning. Three studies (Hollingsworth, 1989; Raymond et al., 1995; Roskos et al., 1994) have support for holding students accountable for course content through individual assignments. Two studies (Hollingsworth, 1989; Roskos et al., 1994) point to candidates' need for support to implement content through direct coaching or on-the-spot help from instructors. Further, experiencing the principle over an extended period as was done in Stofflett's (1994) content learning intervention also has some empirical support. These studies suggest that the use of these five practices will strengthen teacher education programs.

Various theories provide some explanation as to why these instructional

features facilitate candidates' learning. Social perspective theories (e.g., Mead, 1934; Vygotsky, 1978) suggest that as candidates discuss, analyze and engage in problem solving with peers, learning occurs because they internalize the social interaction. Theorists posit that such internalization is mediated by language and other symbol systems (Reynolds et al., 1996). Similarly, these theories also provide reasons for candidates' learning when they interact with or are coached by an instructor.

Other learning theories may account for the effectiveness of the remaining three instructional features. For example, Anderson's (1983, 1987) theory of skill learning termed "ACT*" may provide the reasons why trying out or practicing course content prompts learning among candidates. When confronted with a problem, practice may enable candidates to integrate relevant facts and concepts (declarative knowledge) with notions about how to perform a skill (procedural knowledge). The feedback candidates receive concerning their effort may enable them to revise their thinking, and eventually produce skill performance that is automatic (Winitzky & Kauchak, 1995).

Information processing theories may provide several reasons why candidates learn from both individual assignments and experiencing the principle over an extended period. A primary assumption of these theories is that learning depends on what students do, rather than being attributed solely to environmental events. These two instructional features may prompt learning because they focus candidates' attention on new information, facilitate encoding, and facilitate storage and retrieval (Gredler, 1992). Teacher educators hope that both kinds of practices will help candidates develop "cognitive structures that provide them with socially common knowledge and ways of analyzing and dealing with problems" (Andre & Phye, 1986, p. 16). Candidates' learning, therefore, may occur due to the various kinds of opportunities provided for utilizing this knowledge to solve problems.

Contrary to the pessimists in teacher education, we found evidence suggesting that several teacher education practices lead to significant

learning in preservice teachers. However, more research, especially that oriented to theory-building, is needed. For example, in elaborating a constructivist theory of learning to teach, it is important to develop a theory of learning environments (Gelman, 1996). That is, while we grasp that learners construct their own understanding based on prior knowledge, we as yet do not know what types of learning environments lead students to construct particular understandings. We have a wealth of information now on teacher candidates' prior knowledge, misconceptions, and beliefs, but we have little information on effective ways to modify misconceptions and faulty beliefs.

More and better research is needed to strengthen the knowledge base for teacher education course and program design. Future studies needs to identify the features and combination of features that show the strongest effects. Researchers reporting on the efficacy of their own classes are advised to provide more detailed information about the practices they are using, why they use them, and specific evidence that links program experiences directly to student learning outcomes. Recall that we used investigators' judgements as to whether meaningful learning had happened. However, many investigators failed to provide evidence to demonstrate the links between the instruction used and student outcomes. Less than one-third of the 32 studies provided sufficient evidence to support the claims made concerning the feature(s) that prompted change. That is, researchers did not discuss the data source(s) that enabled them to arrive at their conclusions (e.g., provide direct quotations given by students during interviews or on questionnaires).

Our efforts to strengthen programs would be greatly aided by studies that provide evidence to demonstrate the links between the instruction used with candidates and what they learn. We also need more research that examines why various instructional features aid candidates' learning.

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Table 1

Frequency of Instructional Patterns Across Long-term and Short-term Studies Suggesting Meaningful Change

Study	IA	DAP	VM	UC	EP	TPC	IPC	RRUL	ICI	ETPI	R	ICSC
[a]Beyerbach, 1988												X
Bramald et al., 1995	X			X								
[b]Cooper, 1996	X	X		X		X						
Copeland et al., 1996		X					X					
Florio-Ruane et al., 1990	X	X	X	X	X							X
Herrmann et al., 1993		X		X			X	X	X	X	X	
Hollingsworth, 1989	X			X		X			X	X		
Langrall et al., 1996	X	X	X	X	X	X		X			X	
Lawrence et al., 1996	X	X		X	X		X				X	
Lundeberg et al., 1994	X	X	X	X			X				X	
McDevitt et al., 1993		X	X	X	X					X		X
[c]Metcalf, 1992	X		X	X		X	X				X	

(continued)

Table 1 Continued

Study	IA	DAP	VM	UC	EP	TPC	IPC	RRUL	ICI	ETPI	R	ICSC
[e]Metcalf et al., 1996	X	X				X			X			X
Mokhari et al., 1996	X				X	X	X	X				
Morine-Dershimer, 1993	X	X	X	X	X	X		X				
Morine-Dershimer, 1989	X	X	X		X	X		X	X		X	
[a]Morine-Dershimer et al., 1992				X								
[a,e]Oppewal, 1993												
Pedersen et al., 1992		X		X		X	X					X
Raymond et al., 1995	X	X	X		X			X	X			
Roehler et al., 1990				X								X
Roskos et al., 1994	X	X	X	X	X	X			X			
Rovengo, 1992	X	X		X					X			
Stofflett, 1994	X	X	X	X	X		X	X	X		X	
[f]Stoiber, 1991		X							X			

(continued)

Table 1 Continued

Study	IA	DAP	VM	UC	EP	TPC	IPC	RRUL	ICI	ETPI	R	ICSC
Strahan, 1989	X									X	X	
Tran et al., 1994	X				X		X					
Wilcox et al., 1991		X	X		X			X	X			X
Winitzky et al., 1991 (Study 1)	[g]X	X	X		X	X	X	X		X		
	[h]X	X	X		X	X	X	X		X		
	[i]X		X		X	X	X	X		X		
[j]Winitzky et al., 1991 (Study 2)	X	X	X		X	X	X	X	X	X		
Winitzky et al., 1991 (Study 3)	[k]X	X	X		X	X	X	X				
	[l]X	X	X			X	X	X	X	X		
[e]Yon et al., 1990												
TOTAL FREQUENCY	24	23	17	17	17	16	15	14	12	9	8	7

Note. IA=individual assignments; DAP=discuss/analyze/solve problems with peers; VMB=view modeling; UC=use course content in context; EP=experience the principle over an extended period; TPC=opportunity to tryout or practice course content; IPC=information presented about content via instructor, guest speaker, panel, film; RRUL=repeated reflection/use with limited number of principles; ICI=interaction with or coaching from instructor; ETPI=experienced teacher participation/interaction; R=assigned readings; ICSC=integrate concepts across courses and/or sequence courses
[a]Cross-sectional data that connects learning to the level in the program. [b]University-based course only. [c]Experimental condition only. [d]Laboratory condition only. [e]Instructional approach not described. [f]Reflective condition only. [g]Condition 1. [h]Condition 2. [i]Condition 3. [j]Schema group only. [k]Microteaching. [l]Clinical teacher-led discussion.

Table 2

Instructional Features Used in Studies Reporting Meaningful Learning

Instructional Feature	Definition
View modeling	Candidates see a teaching method, skill, or practice
Use course content in context	Candidates use or practice course content in a school setting with pupils
Information presented about the content	Information is presented about the content via instructor, guest speaker, panel, film, etc.
Repeated reflection on/use of a limited number of principles	Candidates have numerous, and often varied experiences with a limited number of ideas
Experienced teacher participation/interaction	Experienced teachers and candidates interact about course content
Assigned readings	Candidates read about course content
Integrate concepts across courses and/or sequence courses	Courses are sequenced so that candidates' knowledge builds over time, or concepts are integrated across courses
Discuss, analyze, or solve problems with peers	Candidates interact with their peers to construct knowledge
Try out or practice course content	Candidates have opportunities to try out or practice course content

(continued)

Table 2 Continued

Instructional Feature	Definition
Individual assignments	Candidates complete individual, written assignments
Interaction with the instructor	Candidates construct knowledge through social interaction with the instructor
Experience the principle over an extended period	Teacher educators teach in ways that allow candidates to experience the principles they are expected to learn over an extended period